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(71) Applicant and  
(72) Inventor: **SNOPKOWSKI, John, D.** [US/US]; 438 Calle Verde, Morgan Hill, CA 95037 (US).

(74) Agent: **FAHMI, Tarek**; 12400 Wilshire Boulevard, 7th Floor, Los Angeles, CA 90025 (US).

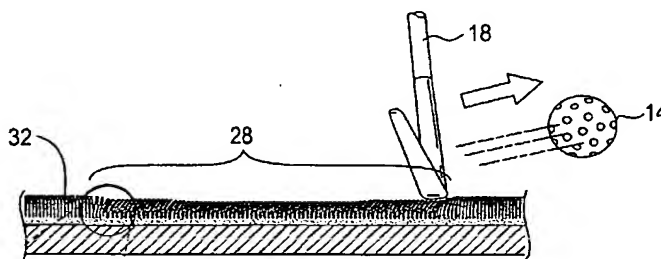
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(54) Title: **DIVOT INDICATING GOLF PRACTICE DEVICES**



(57) Abstract: A golf practice mat that allows a golfer to practice hitting golf shots from a synthetic turf surface that emulates natural grass while still being able to obtain visual feedback regarding the location of impact between the golf club head and the mat relative to the location of the ball prior to being struck.

## **DIVOT INDICATING GOLF PRACTICE DEVICES**

### **RELATED APPLICATIONS**

[0001] The present application is related to, incorporates by reference and claims the priority benefit of U.S. Provisional Application 60/529,048 filed December 11, 2003.

### **FIELD OF THE INVENTION**

[0002] The present invention relates to golf practice devices adapted to provide an indication of where a golf club strikes a mat (and/or, in some cases, the path the club head traverses across such a mat) during the process of hitting a golf ball.

### **BACKGROUND**

[0003] In golf, many factors influence the flight characteristics a golf ball after being struck by the face of a golf club. Among these factors are the path of the club head prior to and during impact with the ball, the club head speed and the portion of the golf ball struck by the golf club. In order to achieve optimum flight characteristics, it is often desirable for the clubface to make contact with the golf ball just prior to or at the same instant as the leading edge of the club head strikes the underlying turf. This simultaneous (or near simultaneous) impact results in a pinching of the golf ball between the clubface and the turf, allowing the golfer to impart backspin to the ball through the action of the grooves on the clubface. Golfers refer to this process as "hitting down on the ball" or hitting the ball with a downward swing.

[0004] In a proper golf swing, after making contact with the ball/turf the club head will generally continue down and forward for some distance, resulting in a cutting of the turf that was in front of the golf ball, before rising to complete the swing arc. Golfers refer to this action as "taking a divot". Ideally, the divot is relatively shallow and short (golfers sometimes liken the size of an ideal divot to the length of a U.S. dollar bill). By

examining the divot relative to the former location of the golf ball a golfer can learn to adapt his or her swing so as to ensure that the bottom-most point of the swing arc coincides with the location of the golf ball resting on the turf, resulting in the pinching action discussed above.

[0005] Unfortunately for many golfers, however, learning to consistently hit down on the ball is not an easy process. Sometimes the tendency is for golfers to try and “get under” the ball (i.e., to use the golf club to scoop the ball off the turf) in order to lift it into the air. Such action tends to cause a weak wrist flip through impact, resulting in shots that are either “fat” (meaning that the club strikes the ground behind the ball causing a loss of momentum) or “topped” (meaning that the club strikes only the top portion of the golf ball, resulting in top spin being imparted to the ball, which tends to minimize the distance the ball will travel). As a result, many hours of practice must often be devoted to developing a mechanically correct swing in order to achieve the proper pinching action between the clubface, the ball and the ground.

[0006] As a result of the need for practice, golfers often frequent practice centers (e.g., driving ranges and the like) in order to work on their swings. Because of the number of golfers that utilize these centers, however, it is often impractical for the operators thereof to permit golfers to practice on natural grass. Instead, the practice center operators typically install synthetic turf practice mats from which the golfers may hit golf shots.

[0007] Many forms of golf practice mats have been developed and used over the past few decades. An example of such a golf practice mat is described in U.S. Patent 3,451,683 of Oliver. Oliver’s practice mat differed from those before it by incorporating synthetic turf bristles that were pivotally secured to a backing member. This was done in an effort to reduce wear, as it had been determined that non-pivotal bristles tended to wear out rather quickly under the repeated action of being struck by a golf club. By incorporating the pivoting bristles some resiliency was provided while preserving the feeling of striking golf balls off of natural turf.

[0008] The idea of providing a practice mat that mimics the feeling of striking a golf ball on natural turf has resulted in the creation of many different varieties of mats. For example, artificial grasses of varying heights have been combined with shock pads of varying thicknesses and, in some cases, with other forms of shock absorbers to create many different forms of golf practice mats to simulate different turf conditions.

Unfortunately, because these mats are synthetic they do not allow the golfer to take a divot when hitting a golf shot. Thus, the golfer cannot determine where the bottom of his or her swing arc truly is, relative to the location of the golf ball on the mat. A valuable feedback mechanism in learning to develop a proper golf swing is therefore lost.

[0009] Recognizing that understanding the location and shape of a divot can be a valuable learning tool, others have attempted to overcome the shortcomings of conventional golf practice mats. A recent example is the divot practice mat described in U.S. Patent Application 2003/0087708 of Tiffin. The Tiffin mat consists of a mark retaining surface having simulated golf balls imprinted thereon and secured to a secure base. The mark retaining surface is described as a “no carbon required paper, carbon paper, or wax containing surface”. Thus, this divot indicating mat is unlike conventional golf practice mats in that it eschews the use of turf-like fibers.

[0010] To use the Tiffin mat, a golfer places a real golf ball on top of an image of a ball imprinted on the mat and hits it. During this process, as the golf club head strikes the mark retaining surface it leaves a mark, thus simulating a divot. By comparing the divot location to the image of the golf ball on which the actual ball had been placed, the golfer can determine whether or not the bottom of his or her swing had coincided with the location of the ball. While the Tiffin mat thus allows a golfer to get some visual feedback about the nature of his or her golf swing, it does not allow the golfer to obtain the feeling of striking a golf ball off of natural turf, as is provided by conventional golf mats.

[0011] Another approach to providing visual feedback regarding a golf swing is described in U.S. Patent 3,717,349 of Bohnen. Bohnen describes a divot indicating golf practice mat made of flexible strands of metal wire supported on a rigid base. The golfer places a golf ball atop the metal strands and then proceeds to hit the ball with his or her golf club. When the golf ball is struck, the metal strands bend in the direction of travel of the golf club head and remain so bent, allowing the golfer to observe a simulated divot. To reset the metal strands into an upright position, the golfer operates a resetting panel, through which the metal strands extend vertically upward. By raising and then lowering the resetting panel, the metal strands are returned to their original vertical orientation with respect to the base and the golfer may then repeat the hitting process.

[0012] By using metal wire strands in place of artificial grass, the Bohnen mat provides a less than ideal environment for golfers wishing to practice their swings. Such metal wires likely will not emulate natural turf to the same degree as modern synthetic turf practice mats. Moreover, golfers may be unwilling to subject their expensive golf clubs to repeated impacts with a metal wire golf mat for fear of damaging or scratching the club head and/or clubface. This is especially true in the case of forged golf clubs made from soft metals. Further, the Bohnen mat provides no indication of where the golf ball was located prior to impact so that even though a golfer can observe a simulated divot after striking the ball, there is no way for the golfer to tell whether the divot was taken at the proper place relative to where the ball had been located.

## **SUMMARY OF THE INVENTION**

[0013] In one embodiment, the present invention provides a divot indicating golf practice device, including a mat made up of synthetic turf fibers (e.g., polypropylene, polyethylene, or nylon fibers) that emulate natural grass and that is configured with one or more indicators or alignment marks arranged so as to provide visual feedback to a golfer regarding a location of impact between a golf club head and the mat relative to a

location of a golf ball upon the mat prior to being struck. The mat may include one or more divot-indicating portions or channel areas arranged so as to permit rotation of the mat so that only one such area is used at a time. Moreover, the mat may include one or more areas of irregular height so as to simulate uphill lies, downhill lies, side hill lies and so on.

[0014] In general, the synthetic turf fibers may be treated so as to show a location of a simulated divot when struck by the golf club head. This may be accomplished by, in some cases, the fibers having one side that is colored differently than another side thereof and/or the fibers may be treated so as to change color when heated due to friction. In other cases, the synthetic turf fibers may include a grain configured to provide a visual indication of where the golf club head strikes the mat. In other embodiments, the mat may include a liquid reservoir adapted to provide liquid to the synthetic turf fibers so as to keep the fibers slightly moist. When struck, the moist fibers will show the path of the club head therethrough/across.

[0015] A further embodiment of the present invention provides a golf practice mat, having synthetic turf fibers that emulate natural grass and are configured to (i) provide a visual indication of an impact of a golf club head with the mat by changing from a relatively upright orientation to another orientation under influence of the golf club head, and (ii) permit removal of said visual indication when the synthetic turf fibers are returned to the relatively upright orientation. As indicated above, the mat may include one or more divot-indicating portions with the one or more indicators are arranged relative thereto so as to permit placement of the golf ball therein.

[0016] Another embodiment of the present invention provides a golf practice mat having a mat area and a storage area configured for storing sand. A layer of sand may be spread over the mat area (which may be made up of synthetic turf fibers), and a golf ball placed atop the layer of sand. Striking the golf ball using a golf club will then produce a simulated divot in the layer of sand.

[0017] In a further embodiment, a golf practice device includes a hollow member filled with a mixture of fine aluminum powder and beads, and a transparent face configured such that the fine aluminum powder will adhere to an inside surface thereof until being dislodged therefrom due to an impact with an outside surface of the face. Such a golf practice device may also include a golf ball alignment aid on either of the inside surface or outside surface of the face.

[0018] In yet another embodiment of the present invention, a golf practice device having a board configured with a magnetophoretic face plate adapted to receive golf club head impacts, and honeycombed internal chambers containing a liquid medium having magnetic particles suspended therein is provided. The magnetic particles may be approximately 10 microns in size and made of magnetic oxides or magnetic alloys.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0019] The present invention is illustrated by way of example, and not limitation, in the figures of the accompanying drawings, in which:

[0020] Figure 1 illustrates a golfer using a golf practice mat configured to provide a simulated divot mark in accordance with an embodiment of the present invention;

[0021] Figure 2 illustrates an example of a divot mark left on a golf practice mat configured in accordance with an embodiment of the present invention;

[0022] Figure 3 illustrates another example of a divot mark left on a golf practice mat configured in accordance with an embodiment of the present invention;

[0023] Figure 4 illustrates an example of a golfer analyzing a divot mark left on a golf practice mat configured in accordance with an embodiment of the present invention in order to obtain information regarding his or her golf swing;

[0024] Figure 5 illustrates an example of a golfer removing a divot mark from a golf practice mat configured in accordance with an embodiment of the present invention;

[0025] Figure 6a illustrates an example of a golf ball resting atop the fibers of a golf practice mat configured in accordance with an embodiment of the present invention;

[0026] Figure 6b illustrates an example of a golf club striking a golf ball resulting in a divot mark being left on a golf practice mat configured in accordance with an embodiment of the present invention;

[0027] Figure 6c illustrates in detail how the fibers of a golf practice mat configured in accordance with an embodiment of the present invention bend or flex under the influence of a golf club during a golf shot played off the mat, resulting in a divot mark being left in the mat in accordance with an embodiment of the present invention; and

[0028] Figure 6d illustrates an example of a golfer removing a divot mark from a golf practice mat configured in accordance with an embodiment of the present invention.

#### **DETAILED DESCRIPTION**

[0029] Described herein are various divot indicating golf practice devices. In one embodiment, a golf practice mat that allows a golfer to practice hitting golf shots from a synthetic turf surface that emulates natural grass while still being able to obtain visual feedback regarding the location of impact between the golf club head and the mat relative to the location of the ball prior to being struck is provided. The present golf mat thus overcomes the disadvantages of previous schemes for indicating divots during golf practice sessions. By providing a golfer with immediate feedback regarding the nature of his/her golf swing, the present golf mat acts as a valuable training tool for the golfer.

[0030] Other embodiments of the present invention include a golf practice mat having a storage area for sand or similar material (i.e., an attached or associated sandbox). Golfers using the mat may sprinkle a layer of sand over the practice area so that when a ball is struck the golf club will clear a path through the sand (simulating a divot) and the golfer can view the results. The sand spreading could be made automated or semi-automated using suitable devices.



[0031] Much of the discussion herein will refer to the present divot indicating golf mat as a complete mat assembly. However, in other embodiments it may be the case that the divot-indicating portion of the golf mat is only a channel or other area (e.g., an insert) of a larger golf mat. In other cases, the divot-indicating golf mat may be a small mat that is to be used in combination with a larger mat or other surface on which the golfer stands (e.g., to ensure that the golfer's feet are at approximately the same height as the ball. Still other configurations may have the divot indicating golf mat (or insert) being of irregular height to simulate "bad lies" as are frequently encountered in real golf. To this end, the divot indicating golf mat (or insert) may provide sections for practicing shots from uphill lies, downhill lies, side hill lies, or other uneven turf conditions.

[0032] The synthetic turf of which the divot indicating golf mat (or insert) is constructed may be optimized to simulate fairway and/or rough conditions. In general, any appropriate fiber or combinations of fibers may be used. For example, the mat may be constructed using polypropylene, polyethylene and/or nylon fibers. In other embodiments, any suitably flexible and durable material that is configured in accordance with the present invention to provide both a turf-like feel and a divot indication when struck by a golf club may be used.

[0033] In order to reduce early failure of the mat due to wear, some embodiments of the divot indicating golf mat are sectioned into two, four or more sections so that the mat can be rotated on a periodic basis by the operator of the golf practice area in which the practice mat is installed. This will generally mean that different areas of the mat will be struck over time and will tend to allow the mat to wear consistently over its entire surface area, rather than in only a few locations. To provide for this rotation capability, the mat bristles may need to be treated so that the divot indicating portions are properly located with respect to the eventual direction of travel of a golf club head. This will be discussed in greater detail below.

[0034] As alluded to above, the present golf mat makes use of artificial grass bristles much like modern conventional golf mats. Synthetic mats of virtually any desired turf condition are commercially available today. However, unlike conventional synthetic turf, the turf from which the present golf mat is made includes synthetic fibers that are treated so as to show the location of a simulated divot when struck by a golf club. The treatment may result in the turf fibers having one side that is shaded or colored differently than the other or the fibers may be treated so as to change color or tone when heated due to the friction between the golf club head and the mat during a practice golf shot. The overall effect is to simulate a "grain" in the synthetic turf that will provide a visual indication of where the golf club strikes the mat.

[0035] In various embodiments, the "grain-like" effect of the present practice mat may be implemented by constructing the mat so that the fibers thereof are attached in a slant-wise orientation with respect to a bottom surface of the mat. Conventional golf practice mats are constructed using fibers that are tied into clusters which are bound to a common backing material. These clusters may be held together in rows using thread or rope, which in turn is bound to the backing material. In accordance with the present invention, similar construction techniques may be used, however, rather than orienting the clusters of fibers so that they are approximately perpendicular to the backing surface of the mat, the clusters may be oriented at an angle thereto. This will mean that the fibers will lay somewhat sideways against the backing surface when viewed from the top. When a golf club strikes such a grouping of fibers in a direction opposite to that in which the fibers lie, the net effect will be to displace those fibers from their original position (e.g., towards the vertical with respect to the bottom surface of the mat) thereby indicating the path which the golf club head traveled across the mat. Because of the fibers' inherent stiffness they will remain so displaced until replaced (e.g., by sweeping them back into their original position), allowing ample opportunity for a golfer to inspect the results of his or her swing.

[0036] Yet another method for creating the grain-like effect involves mounting the fibers of the mat so that the clusters of fibers are tied off below a separation layer positioned between the base of the mat and a top portion of the fibers. This will allow the fibers to “hinge” in their motion when struck by a golf club. Now, if opposite sides of the fibers are painted different colors (or otherwise treated so as to exhibit visual distinctions) then when a golf club head strikes the mat, those fibers affected by the golf club head’s travel will be displaced so that color distinctions will appear between the fibers so affected and those not affected. In this way, the path of the club head can be observed. Note that for such an embodiment of the present practice device it may be advantageous to have a thread or rope connecting clusters of fibers in a row oriented so that the path of the club head is perpendicular thereto. This will help to maximize the hinge-like effect of the fibers’ motion.

[0037] In other embodiments, the present golf practice mat may be configured to include a liquid (e.g., water) reservoir that keeps the fibers of the golf mat slightly moist. In such cases, when a golf club strikes the mat it will trace a path through the moist mat bristles that will remain visible for some period of time. This can serve to indicate the divot that would have resulted from the golf shot, thus providing the desired visual feedback.

[0038] To better understand the nature and characteristics of the present golf mat, refer first to **Figure 1**. In this illustration a golfer 10 is standing on a golf mat 12, which is configured in accordance with an embodiment of the present invention. A golf ball 14 rests on mat 12, which is constructed of synthetic, grass-like fibers so as to simulate the feeling of hitting a ball off of natural turf. The ball 14 has been placed between a pair of alignment marks 16 that are impressed or otherwise indicated on the mat. These alignment marks may be a pair of lines (as shown in the illustration), a single solid line, multiple such lines (e.g., in a row or column so as to allow the pre-positioning of multiple golf balls), simulated golf balls (such as used in connection with the Tiffin mat described above), or any other form of permanent (or even semi-permanent) marking on

the golf mat 12 that will allow the golfer to remember where the golf ball had been located prior to being struck by the golf club.

[0039] As shown, the golfer 10 is in the process of hitting the ball 14. More particularly, the golfer 10 is mid-way through his downswing. The objective is for the golfer to strike the golf ball 14 with the golf club 18, at the same instant as or just prior to striking the mat 12.

[0040] Referring now to **Figure 2**, we see that the golfer has hit the golf ball 14 with the club 18 and the ball is in flight. Notice the mark 20 that has been left on mat 12. This is the simulated divot that is left on the mat as a result of the golf club 18 (more particularly the club head) making contact with the mat bristles. By comparing the starting position 22 of divot mark 20 with the alignment mark 16 (which indicates the former resting position of the golf ball 14 on mat 12), we see that the golfer 10 swung the golf club 18 so as to strike the mat 12 well before the golf ball. Had this been an actual golf shot off of actual turf, the golf club head would have either bounced off the ground and into the ball 14 or it might have carved out a divot well under the ball. In either case, it is likely that a less than optimal golf shot would have resulted.

[0041] In addition to noting the initial impact point (i.e., the entry point) 22 of the golf club 18 on the mat 12, the divot mark 20 provides some indication of the path of the golf club head through impact with the golf ball 14. In this instance, the mark 20 indicates that the club head traveled on a generally inside to outside swing path. Depending on the type of golf shot that the golfer had been trying to hit, this may or may not have been the desired swing path. Other paths that may be so indicated include outside-to-inside paths and down-the-line paths.

[0042] Another example of a divot mark is illustrated in **Figure 3**. This time, the divot mark has a starting point 26 that is virtually coincident with the golf ball alignment marks 16, indicating that the club head made contact with the mat 12 at virtually the same instant as the clubface struck the golf ball 14. Had this been an actual golf shot

from actual turf, the divot would have started at or about the actual location of the golf ball on the turf, meaning that during the shot the golf ball would have been pinched between the clubface and the turf in the desired fashion.

[0043] By comparing the divot mark indications in Figures 2 and 3, it should be evident that the present divot indicating golf mat allows a golfer to develop a golf swing that consistently allows the golfer to pinch the ball against the turf. Stated differently, through the use of the visual feedback provided by the divot indications on the golf mat 12, relative to the location of the golf ball prior to being struck during the golf shot, the golfer will learn to swing the golf club so as to make the lowest point of the swing coincident with (or just forward of) the position of the golf ball as it rests on the ground. The visual feedback provided by the present golf mat thus affords the golfer the opportunity to observe his or her own swing flaws (as evidenced by divot marks that do not coincide with the location of the golf ball on the mat 12), and also observe the effects of corrections to his or her swing.

[0044] Turning now to **Figure 4** we see the golfer 10 analyzing a divot mark 28 left on mat 12 after the golfer's last shot. From the location of starting point 30 it appears the golfer struck the mat just behind the golf ball (assuming the ball had been positioned in the space indicated by the alignment marks 16). Now, to "reset" the mat in preparation for the next shot, the golfer needs to remove the divot indication mark 28.

[0045] As shown in **Figure 5**, this is accomplished by simply swiping the turf of golf mat 12 in the direction opposite to that traveled by golf club 18 during the golf shot. In this case, the swiping motion of the golfer's foot over the mat 12 is sufficient to return the mat bristles to their original upright (or nearly upright) position and thereby remove the indication of the divot mark 28.

[0046] This sequence of events is further illustrated in **Figures 6a – 6d**. In **Figure 6a** we see the golf ball 14 resting atop the bristles 32 of golf mat 12. As shown in **Figure 6b**, when the golf ball 14 is struck by golf club 18 during a golf shot, the ball is carried off

the mat. Owing to the golf club's downward and forward travel the divot mark 28 is left behind, indicating the path the golf club 18 traversed. As shown, the impact and motion of the golf club 18 through the bristles 32 will cause some or all of the bristles in the vicinity of the club head path to bend or flex in the direction of travel. It is this bending or flexing that results in the visual indication of a divot mark being produced as the bent fibers will present as a different color or tone (as compared to the other fibers of the golf mat 12) when observed by the golfer.

[0047] Such displacement of the fibers 32 is likely to be small. However, as shown in Figure 6c, if the back side 34 (an arbitrary designation) of the synthetic fibers 32 are painted or otherwise colored differently than the front side 36 of the fibers, even this small displacement will cause a visual contrast between the "divot fibers" (i.e., those that were struck and bent over by the golf club during the golf shot) and the "non-divot fibers" (i.e., those that were not so struck) of the mat 12 at the location of the simulated divot (as observed by the golfer). That is, the small displacement of the fibers 32 will be sufficient to indicate the path of the club head during the golfer's swing and result in the establishment of a divot mark sufficient for the purposes of the present invention.

[0048] Then, as shown in Figure 6d, after the divot mark has been evaluated it is a simple matter of the golfer 10 swiping his or her foot (or hand, club head, etc.) over the mat 12 in the direction opposite to that traveled by golf club 18 during the golf shot, in order to return the fibers 32 to a more or less upright position, thereby eliminating the visual indication of the former divot mark.

[0049] In other embodiments, rather than having two-color or two-tone fibers for the golf mat 12, the fibers may be treated so as to be heat sensitive. In such cases, as the golf club 18 passes through the fibers 32 during the golf shot, the friction between the golf club and the fibers will result in heat, which may cause the heat sensitive fibers to change color or tone for a few moments. Of course the color change will be a local phenomena, restricted to those fibers that came into contact with the golf club (and perhaps those

adjacent to such fibers). This is desirable because it means that only the fibers that would be indicative of the divot taken during the golf shot would change color and serve to provide a temporary divot mark indication on the mat 12. The divot mark could then be removed simply by waiting a few moments for the fibers to return to ambient temperature.

[0050] In still further embodiments, the portion of the golf mat 12 used for divot indications (or the entire mat, in some cases) may be constructed so as to have a liquid (e.g., water) reservoir under the synthetic turf fibers. The fibers that are in this region will, as a result of a wicking action, become wet. Thereafter, when these fibers are struck and bent over as a result of impact by the golf club, the apparent color or tone of the fibers will appear different from those of the surrounding golf mat. For example, these divot-indicating fibers may appear darker or lighter than the surrounding fibers after being struck, because more surface area of the fiber is now visible as a result of being slightly bent over.

[0051] An example of this phenomenon may sometimes be observed in the early morning hours at a golf practice area. Often, the golf mats at this time of day are damp, either because they were in the path of one or more water sprinklers or, more likely, because of the morning dew adhering to the golf mat surface. If one strikes golf balls off of such a mat, he or she will observe an apparent divot mark on the mat as moisture is displaced from the mat fibers struck by the club head.

[0052] By providing a golf mat with a liquid reservoir under some or all of the turf fibers, this effect of the morning dew is maintained longer than would occur naturally (e.g., as the mat heats up in the sunlight or through use by golfers). Consequently, the divot marks can be observed in the mat no matter what time of day it is used. To remove the divot mark in such a mat, one need only swipe his or her foot across the mat to return the turf fibers to their original and mostly upright position.

[0053] Many other embodiments of the present invention may also be realized. For example, in some embodiments the turf fibers may themselves include liquid reservoirs for storing water or another fluid used to provide a visual indication of the club head entry point and swing path. This may be in addition to or in place of a large liquid reservoir located underneath or adjacent to the mat.

[0054] In still further embodiments it is not necessary that the golfer actually strike a golf ball into free flight. For example, training aids that provide a golf ball suspended from a rod or cord may be positioned so that the golf ball rests on or above a golf practice mat configured in accordance with the present invention. When struck, the golf ball will spin about an axis, coming to rest at its starting position. By comparing this starting position to the divot indication left on the practice mat, the golfer can analyze his or her swing mechanics in the same fashion as described above.

[0055] A further embodiment of the present invention provides a golf practice mat having a storage area for sand or similar material (i.e., an attached or associated sandbox). Golfers using the mat sprinkle a layer of sand over the practice area where a ball is placed (i.e., opposite appropriate golf ball position indicators) so that when a ball is struck the golf club will clear a path through the sand (simulating a divot) and the golfer can view the results. The sand spreading could be made automated or semi-automated using suitable devices.

[0056] A related golf practice device resembles a so-called lie board, used in golf club fitting applications. The traditional lie board is a hard plastic board approximately 15" - 24" long, 8" - 15" wide, and 1/2" thick. Golfers purchasing new golf clubs often are instructed to hit golf balls off of such a lie board using golf clubs having impact indicating tape applied to the sole of the club head. By examining the area of the sole that strikes the lie board first during a golf shot, club fitters can properly fit the golfer to golf clubs having the correct lie angle (i.e., the angle between the shaft and the sole of the golf club).



[0057] The present invention modifies the lie board to be a divot-indicating device. Thus, when a golf ball is positioned opposite suitable alignment marks and the golfer then hits the ball, an impression is left in the lie board simulating a divot and the golfer can analyze the results in a fashion similar to that discussed above. Different technologies may be used to fashion the divot-indicating lie board.

[0058] For example, the lie board may be made hollow and filled with mixture of extremely fine aluminum powder and beads similar to that found in the popular children's toy Etch-a-Sketch<sup>TM</sup>. The beads help the powder to flow evenly. The lie board will have a transparent face (made of a suitably hard plastic to resist shattering when struck by a golf club) and when turned upside down and shaken the fine aluminum powder will coat the inside of the face. This same phenomenon is observed when using an Etch-a-Sketch. The powder adheres to the underside of the lie board face until the top surface is struck by a golf club during a golf shot. The force of the golf club impact will dislodge the powder, leaving a divot-like impression in the powder (i.e., the absence of powder adhering to the underside of the face of the lie board), which the golfer can then analyze. If golf ball alignment devices are provided on the top (or underside) of the lie board face, the location of the divot vis-à-vis the former location of the golf ball will be apparent.

[0059] Similar results may be achieved using a lie board configured with a magnetophoretic face plate and honeycombed internal chambers containing a thick liquid suspension or dispersion medium filled with tiny magnetic particles. The liquid dispersion medium may be designed so that the particles can be pulled through the liquid in response to magnetic force applied by a golf club having a magnetized club head, but they will not change their position (float or sink) due to gravity. Similar technology was used in the development of the Magna Doodle<sup>TM</sup> product produced by Pilot Pen Corporation.

[0060] Because the particles require the presence of a magnetic club head over the face of the lie board in order to be attracted to the top of the honeycombed chambers, this configuration of the present invention may be best used to evaluate a putting stroke, rather than a full swing. In a putting stroke the putter head remains close to and parallel with the ground (i.e., the top of the lie board) and so the magnetic attractions from a specially magnetized putter head will be sufficient to influence the movement of the magnetic particles. Thus, a line of particles showing the path of the putter head back and through the putting stroke will be produced under the transparent top of the lie board. A club head moving as in a full swing may move so fast through the impact zone that the particles are not sufficiently influenced in order to create a divot pattern, but if the club head is sufficiently magnetized there may be sufficient influence to at least indicate the point of impact, which can be compared to the former ball position embossed or otherwise indicated on the lie board.

[0061] The liquid used in this configuration of the lie board is thick so as to prevent the magnetic particles from sinking. Thus, once drawn to the top of the honeycomb chambers the particles stay in place (allowing the golfer to analyze the point of impact or putting stroke) until erased. Erasing is accomplished using a magnetic slider on the underside of the honeycomb chambers, similar to that used for the original Magna Doodle. so what you have written stays at the front of the display over time. In particular, the liquid may be water, glycol or organic solvent/oil-based, and has particulate thickeners such as waxes (e.g., olefinic polymer, or olefinic copolymer wax), fatty acid derivatives (e.g., fatty acid amide, dextrin fatty acid ester), or metal soap.

[0062] The magnetic particles may be dark, small and fine (about 10 microns). This allows them to be seen easily, to stack up and to be nearly unaffected by gravity. Magnetic oxides (e.g., black magnetite, gamma-hematite, chromium oxide, ferrite) or magnetic alloys (iron, cobalt, nickel) may be used. A dye (such as a white or colored pigment) may be mixed in to provide high contrast to the dark magnetic particles. The

middle layer is preferably latticed so that there is always an even distribution of the magnetic particles across the entire surface of the display.

[0063] Thus, various divot indicating golf practice devices have been described.

## CLAIMS

What is claimed is:

1. A divot indicating golf practice device, comprising a mat made up of synthetic turf fibers that emulate natural grass and configured with one or more indicators arranged so as to provide visual feedback to a golfer regarding a location of impact between a golf club head and the mat relative to a location of a golf ball upon the mat prior to being struck.
2. The divot indicating golf practice device of claim 1, wherein the mat includes a divot-indicating portion comprising a channel area within the mat and the one or more indicators are arranged relative to the divot indicating portion so as to permit placement of the golf ball within the divot indicating portion.
3. The divot indicating golf practice device of claim 2, wherein the mat includes multiple divot-indicating portions arranged so as to permit use of only one of the divot-indicating portions at a time according to orientation of the mat.
4. The divot indicating golf practice device of claim 1, wherein the mat includes one or more areas of irregular height.
5. The divot indicating golf practice device of claim 4, wherein the one or more areas of irregular height comprises mat sections simulating one or more of: uphill lies, downhill lies, or side hill lies.
6. The divot indicating golf practice device of claim 1, wherein the mat comprises one or more of: polypropylene, polyethylene, or nylon fibers.
7. The divot indicating golf practice device of claim 1, wherein the mat comprises synthetic turf fibers treated so as to show a location of a simulated divot when stuck by the golf club head.

8. The divot indicating golf practice device of claim 7, wherein the synthetic turf fibers have one side that is colored differently than another side thereof.

9. The divot indicating golf practice device of claim 7, wherein the synthetic turf fibers are treated so as to change color when heated due to friction.

10. The divot indicating golf practice device of claim 1, wherein the synthetic turf fibers include a grain configured to provide a visual indication of where the golf club head strikes the mat.

11. The divot indicating golf practice device of claim 1, further comprising a liquid reservoir adapted to provide liquid to the synthetic turf fibers of the mat so as to keep the fibers slightly moist.

12. The divot indicating golf practice device of claim 1, wherein the one or more indicators comprise a pair of alignment marks impressed on the mat and arranged so as to permit placement of the golf ball therebetween.

13. The divot indicating golf practice device of claim 1, wherein the one or more indicators comprise illustrations of golf balls arranged so as to permit placement of the golf ball thereon.

14. A golf practice mat, comprising synthetic turf fibers that emulate natural grass and are configured to (i) provide a visual indication of an impact of a golf club head with the mat by changing from a relatively upright orientation to another orientation under influence of the golf club head, and (ii) permit removal of said visual indication when the synthetic turf fibers are returned to the relatively upright orientation.

15. The golf practice mat of claim 14, wherein the mat includes a divot-indicating portion comprising a channel area within the mat and the one or more indicators are arranged

relative to the divot indicating portion so as to permit placement of the golf ball within the divot indicating portion.

16. The golf practice mat of claim 15, wherein the mat includes multiple divot-indicating portions arranged so as to permit use of only one of the divot-indicating portions at a time according to orientation of the mat.

17. The golf practice mat of claim 14, wherein the mat includes one or more areas of irregular height.

18. The golf practice mat of claim 17, wherein the one or more areas of irregular height comprises mat sections simulating one or more of: uphill lies, downhill lies, or side hill lies.

19. The golf practice mat of claim 14, wherein the synthetic turf fibers comprise one or more of: polypropylene, polyethylene, or nylon fibers.

20. The golf practice mat of claim 14, wherein the synthetic turf fibers are treated so as to show a location of a simulated divot when stuck by the golf club head.

21. The golf practice mat of claim 14, wherein some or all of the synthetic turf fibers have one side that is colored differently than another side thereof.

22. The golf practice mat of claim 14, wherein some or all of the synthetic turf fibers are treated so as to change color when heated due to friction.

23. The golf practice mat of claim 14, wherein some or all of the synthetic turf fibers include a grain configured to provide the visual indication.

24. A golf practice mat, comprising a mat area and a storage area configured for storing sand.

25. A method, comprising spreading a layer of sand over a golf practice mat made up of synthetic turf fibers, and striking a golf ball placed atop the layer of sand using a golf club so as to produce a simulated divot in the layer of sand.

26. A golf practice device, comprising a hollow member filled with a mixture of fine aluminum powder and beads, and a transparent face configured such that the fine aluminum powder will adhere to an inside surface thereof until being dislodged therefrom due to an impact with an outside surface of the face.

27. The golf practice device of claim 26, further comprising a golf ball alignment aid on either of the inside surface or outside surface of the face.

28. A golf practice device, comprising a board configured with a magnetophoretic face plate adapted to receive golf club head impacts, and honeycombed internal chambers containing a liquid medium having magnetic particles suspended therein.

29. The golf practice device of claim 28, wherein the magnetic particles are approximately 10 microns in size.

30. The golf practice device of claim 28, wherein the magnetic particles comprise one of: magnetic oxides or magnetic alloys.

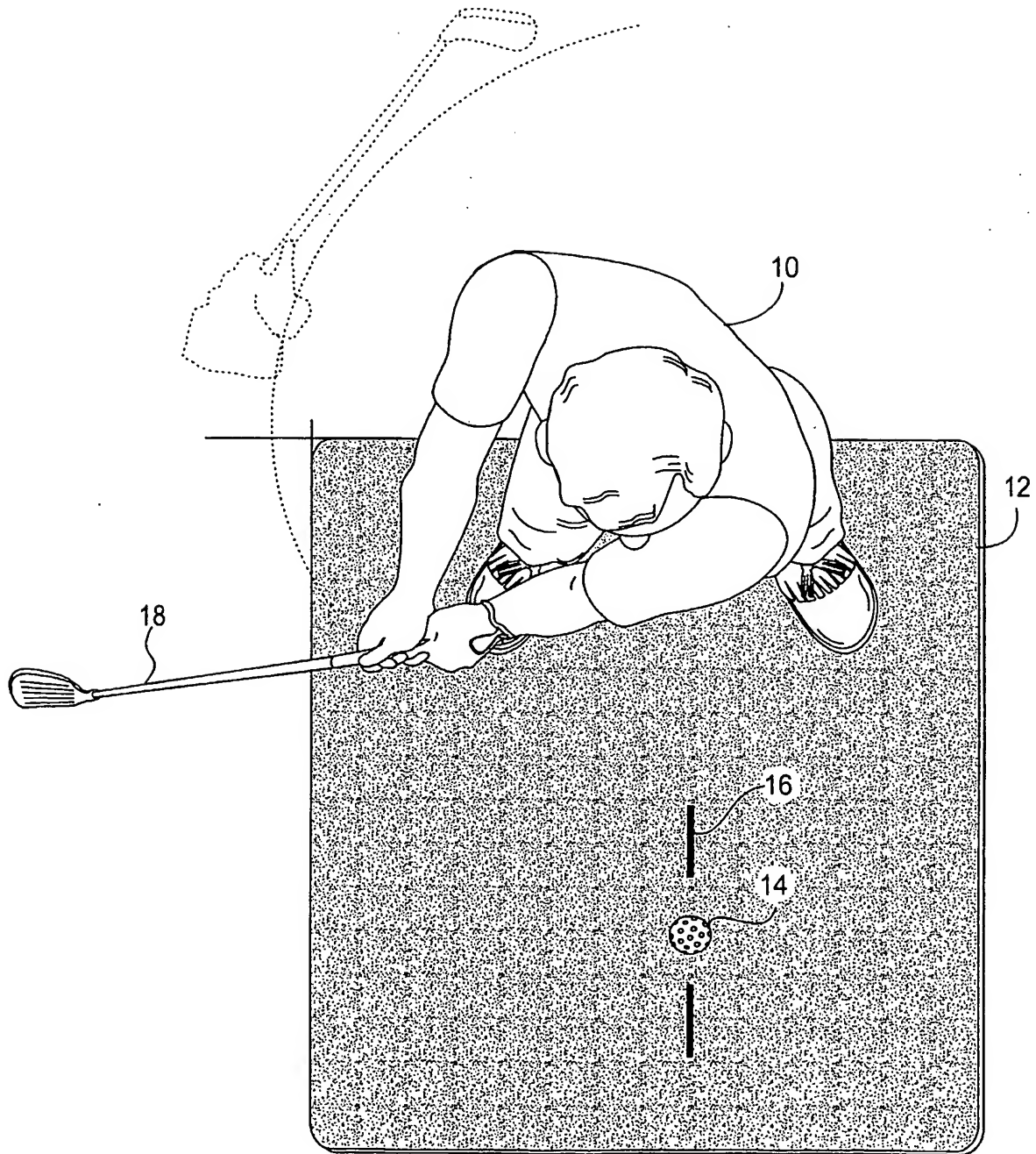


FIG. 1



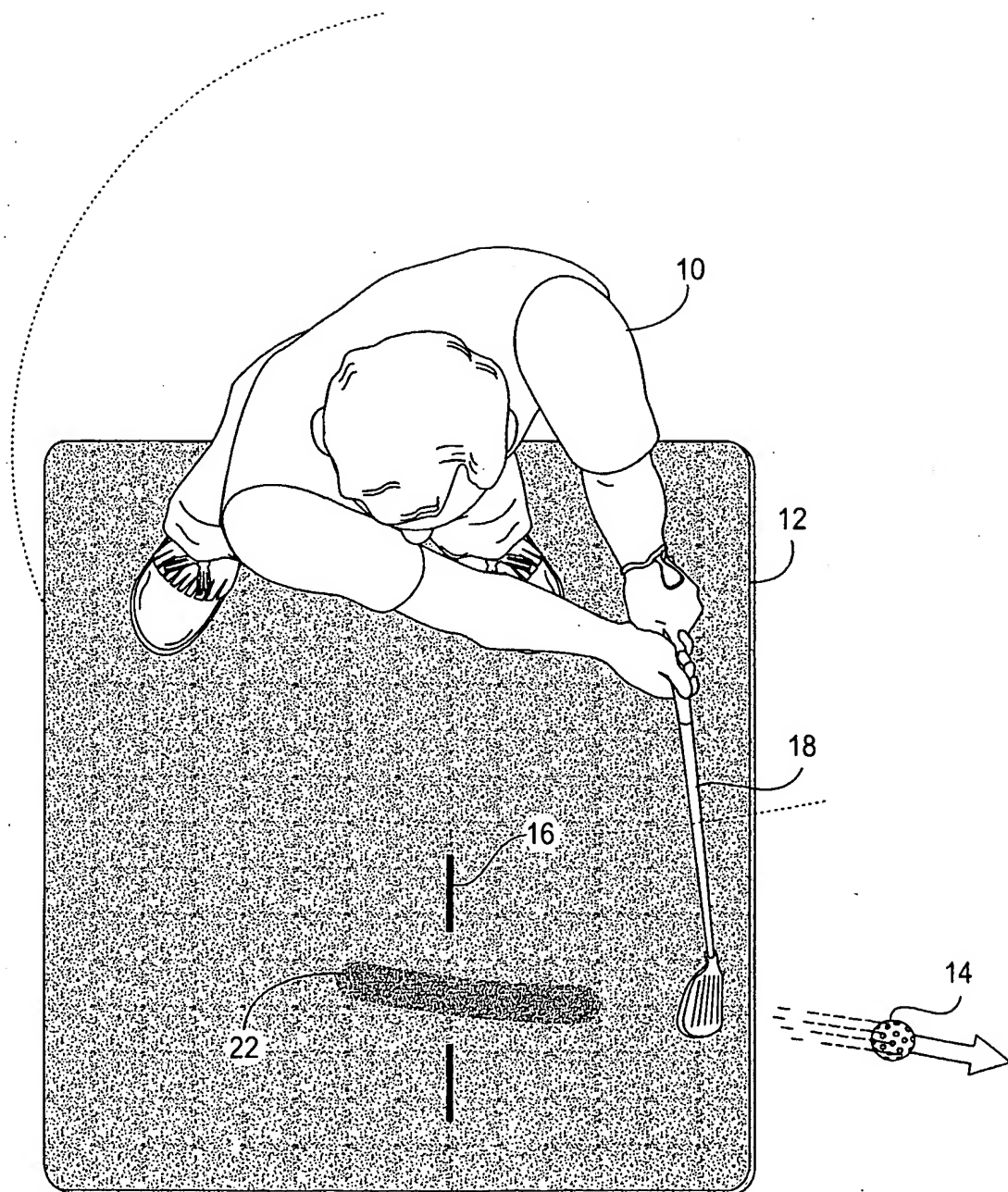


FIG. 2

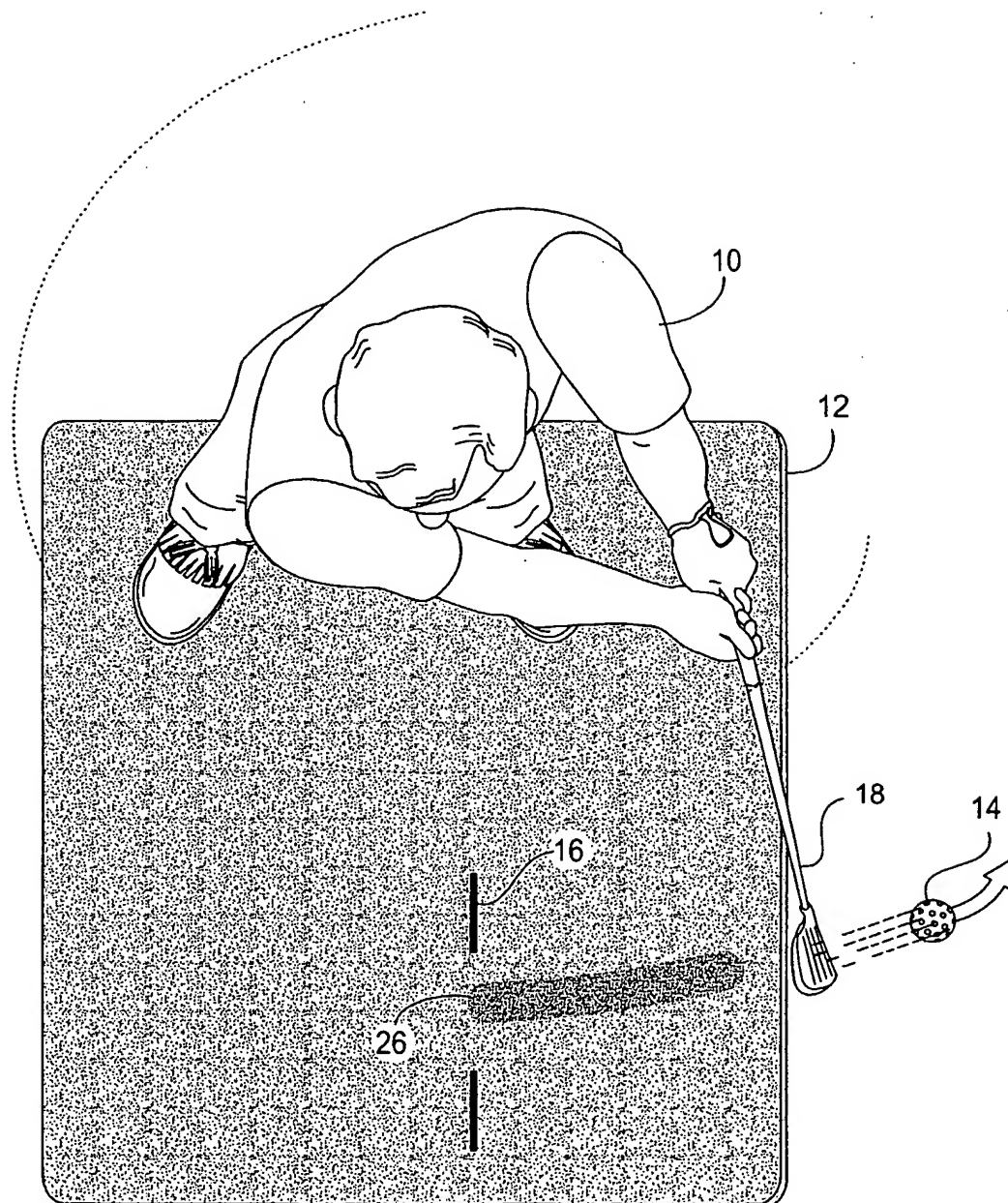


FIG. 3

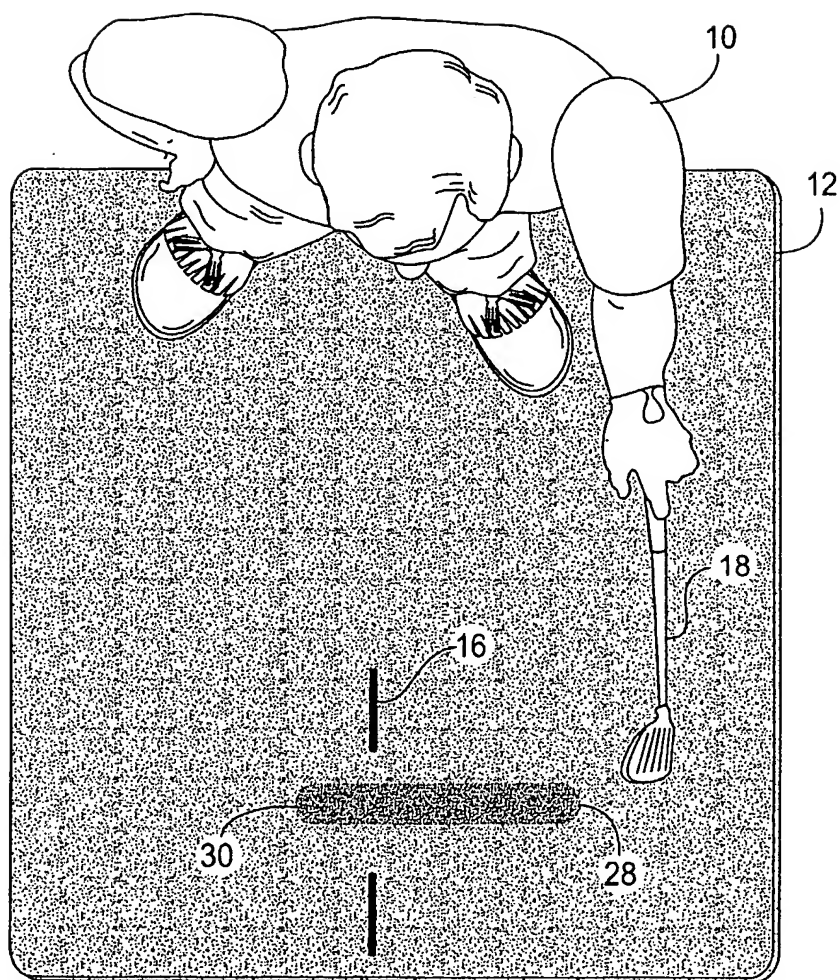


FIG. 4

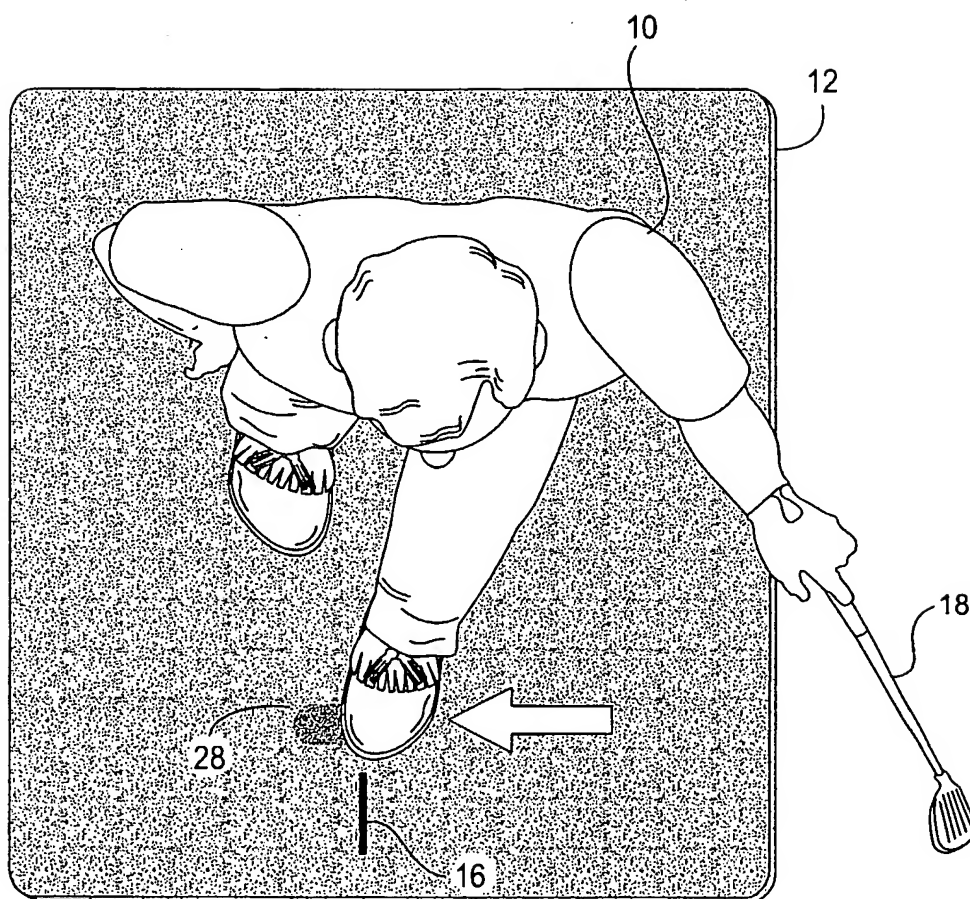


FIG. 5

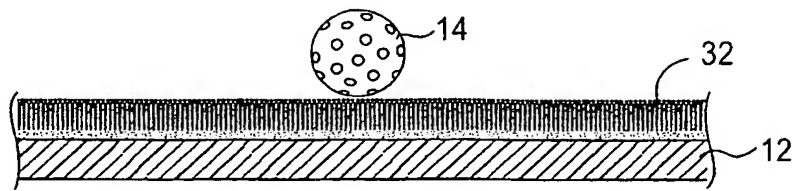


FIG. 6a

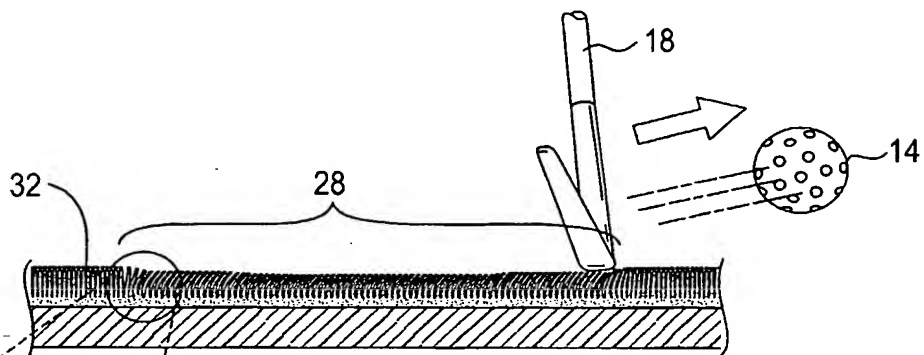


FIG. 6b

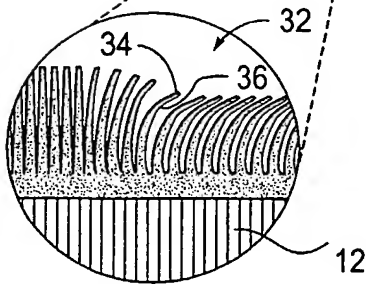


FIG. 6c

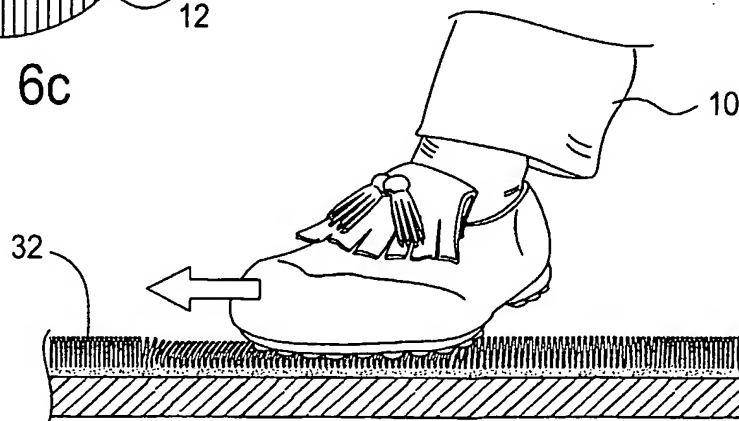


FIG. 6d